DUANE ARNOLD ENERGY CENTER

MOTOR OPERATED VALVE PROGRAM PLAN

MOV 1.1

REVISION 0

Prepared by: _____ Date: 3-10-94

Verified by: _____ Date: 3/11/94

Approved by: _____ Date: 3/10/94
Manager, Corporate Quality Assurance

Approved by: _____ Date: 3-10-94
Plant Superintendent - Nuclear

Approved by: _____ Date: 3/10/94
Manager, Engineering

Approved by: _____ Date: 3/1-/94
Vice President - Nuclear

Effective Date: March 11, 1994

RECORD OF REVISION

Revision	Description	Effective Date
0	Original Issue as MOV 1.1. Previous versions of this Program Plan were issued with DAEC-89-0920, NG-92-1368 and NG-93-0906.	03-11-94

TABLE OF CONTENTS

1.0 PURPOSE

This Program Plan establishes the requirements and expectations for the testing, inspection, maintenance and engineering evaluation of motor operated valves (MOVs) to ensure that they will operate when subjected to conditions that are within the design bases of the Duane Arnold Energy Center (DAEC).

Additional detail regarding the DAEC MOV Program is contained within the MOV Program Manual.

2.0 SCOPE

Appendix A identifies the safety-related (Quality Level 1) valves with motor operators at the DAEC. This includes all of the safety-related motor operators at the DAEC. Of the valves identified in Appendix A, those with active safety function(s) shall be demonstrated to be capable of operating when subjected to conditions that are within the design bases of the DAEC (see Section 5.0).

3.0 RESPONSIBILITIES

3.1 Vice President - Nuclear has the overall responsibility for clearly establishing the expectations within this Program Plan, assuring that the expectations are met and that the DAEC commitments to NRC Generic Letter 89-10 (and its supplements) are satisfied.

3.2 Manager, Engineering has the overall responsibility for the implementation of this Program Plan at the DAEC, including determination of scope, engineering evaluations and project management.

3.3 Plant Superintendent - Nuclear has the responsibility to ensure that adequate resources are allocated and utilized for the maintenance and testing required to implement this Program Plan at the DAEC.

4.0 DEFINITIONS

The following definitions supplement those contained in the Quality Assurance Manual, Appendix B.

4.1 Active Safety Function- the MOV is required to reposition from the standby readiness position to ensure the integrity of the reactor coolant pressure boundary, the capability to shutdown the reactor and maintain it in a safe shutdown condition, and/or the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guidelines of 10CFR100.

4.2 **Industry Publications**- written documents issued to the DAEC which include, but are not limited to, generic letters, information notices, bulletins, service letters, Part 21 notifications and test reports.

4.3 **Practicable**- the dynamic testing can be performed within system design parameters for normal operation without causing situations which might:

- damage or impair plant equipment and/or systems,
- create adverse safety implications,
- cause violation of DAEC Technical Specifications, or
- challenge safety systems or personnel safety.

4.4 **Similar Valve**- an MOV that is functionally (parallel train) and/or physically (sibling) similar to the MOV that was tested, such that the test data could be reasonably expected to apply.

4.5 **Pressure Locking**- a phenomenon that can occur in gate valves when a differential pressure is created between the bonnet cavity region and the local line pressure. This may be caused by a temperature increase of the bonnet cavity region and/or a decrease in the local line pressure after pressurized fluid has entered the bonnet cavity region.

4.6 **Thermal Binding**- a phenomenon that can occur in gate valves when the valve body and discs mechanically interfere due to different thermal expansion characteristics. This may occur when the system cools down after closing the valve with the system hot. Reduced valve internal clearances and excessive closing force may increase the effects of this phenomenon.

5.0 REQUIREMENTS

The following requirements are the basic commitments to NRC Generic Letter 89-10 and its supplements:

5.1 Each MOV identified in Appendix A shall have documentation defining its active safety function(s), if any.

5.2 Each MOV with an active safety function shall be demonstrated through design review, calculation, evaluation, inspection and/or performance testing to be capable of performing its active safety function(s) when subjected to conditions that are within the design bases of the DAEC.

5.3 All activities and documentation shall meet the requirements of the applicable criteria in 10CFR50, Appendix B.

5.4 Revision of this Program Plan shall be clearly communicated to the NRC.

6.0 EXPECTATIONS

The following expectations will ensure that the requirements are satisfied:

6.1 Design Basis Reviews include those activities necessary to identify the engineering limits and margins that define the MOV capability to perform its active safety function(s).

6.1.1 Active Safety Functions

Design basis documents will be reviewed in order to establish the active safety function(s) for each MOV within the scope of this program.

6.1.2 System and Environmental Conditions

Design basis documents will be reviewed in order to establish the system and environmental conditions that may exist when each MOV is required to perform an active safety function. The system conditions should include line pressure, maximum expected differential pressure, flow rate and fluid temperature. The environmental conditions should include those conditions that have a direct impact on MOV capability (e.g.- ambient temperature).

6.1.3 Weak Link Limits

The structural capability of the MOV (both valve and operator) will be established such that no physical damage will occur that could adversely affect the ability to perform a safety function. Loads and load combinations shall appropriately represent the conditions (e.g.- thrust, torque, line pressure, differential pressure, temperature, seismic) the MOV could be subjected to.

6.1.4 Control Circuit Logic

The control circuit logic for each MOV with an active safety function will be appropriate for the function(s) to be performed. A standard control circuit logic convention should be established for each functional application. These standards should reflect appropriate consideration for torque or limit seating, open torque switch bypass and open torque switch jumper. The control circuit logic for each MOV with an active safety function should be reviewed for consistency with the applicable standard and any discrepancies resolved by evaluation and/or modification.

6.1.5 Degraded Voltage

The MOVs shall be capable of performing their active safety function(s) under degraded voltage conditions, consistent with design basis documents.

6.1.6 Thermal Overload Protection

Thermal overloads for an MOV with an active safety function will be sized to provide motor protection, without impairing the MOV capability to perform its active safety function(s).

6.1.7 Control Switch Settings

The design basis conditions and structural limits shall be appropriately considered when determining the thrust window for the control switch settings. This should include margins based on programmatic assumptions (e.g. - lubrication, valve factor) and installed components (e.g. - motor torque, gear ratio, spring pack).

6.2 **Control Switch Setting Verification** includes those activities necessary to provide assurance of the MOV capability to perform its active safety function(s).

6.2.1 Test Acceptance Criteria

Limits established for test data acceptance criteria shall appropriately account for uncertainties (e.g. - test equipment inaccuracies, torque switch repeatability) to provide assurance of MOV operability.

6.2.2 Static Testing

Each MOV that has an active safety function shall be tested in the direction of the active safety function(s) under static conditions to verify that the control switch settings meet the established acceptance criteria.

6.2.3 Dynamic Testing

Each MOV selected for dynamic testing will be tested under the system conditions (e.g.- line pressure, differential pressure, flow rate, temperature) necessary to gather test data suitable for demonstrating capability to perform its active safety function(s) and/or the validation of assumptions or conservatism in the methodology.

6.2.4 Periodic Testing

Static testing will be performed within an appropriate frequency, not to exceed five years (without justification), to verify the MOV capability to perform its active safety function(s). Static testing performed as post maintenance testing may be considered as a periodic test.

6.2.5 Post Maintenance Testing

Appropriate testing will be performed following maintenance activities to verify that the MOV capability to perform its active safety function(s) has not been adversely affected.

6.2.6 Multi-Stage Approach

A combination of analytical (MOV performance prediction) and testing (static and/or dynamic at reduced system conditions) techniques will be utilized to demonstrate MOV capability to perform its active safety function(s) for MOVs that can't practicably be tested at full system conditions.

6.3 **Deficiency Reporting and Operability Assessment** shall utilize appropriate process(es) to document and correct deficiencies within the following guidelines:

6.3.1 A reasonable period of time, typically not more than 24 hours, will be utilized to thoroughly evaluate any potential deficiency in order to properly assess MOV operability. Following this evaluation, any deficiency that exists will be documented.

6.3.2 Control switch setting adjustments necessary to restore desired margins may be performed via the routine maintenance process and schedule, provided the existing in-plant control switch settings are adequate for MOV operability.

6.3.3 Hardware and control switch setting deficiencies that do affect MOV capability, but do not affect system operability, will be reported to plant management in a timely manner to allow the system operability assessment to be concurred with. The operability assessment and concurrence shall be documented.

6.3.4 Hardware and control switch setting deficiencies that could prevent the performance of an active safety function under design basis conditions will be reported to plant management and the OSS in a timely manner to allow the required actions to be taken (e.g.- enter LCO, remove MOV from service). At least one of the corrective action documents shall provide for the assessment of reportability.

6.4 **Program Issues** include general topics to be considered throughout the implementation of this Program Plan. These and other specific topics will be addressed in the MOV Program Manual.

6.4.1 Similar Valves

When evaluating or applying new information (e.g.- from test data or industry publications) for generic implications, similar valves will be considered.

6.4.2 Dynamic Testing Scope

Dynamic tests (at or near the system conditions established for the MOV) will be performed as necessary to establish or substantiate assumptions used to determine control switch settings, provided the dynamic testing is practicable.

6.4.3 Test Equipment Inaccuracies

Inaccuracies applicable to the test equipment used will be appropriately combined and accounted for in the acceptance criteria to provide assurance of MOV capability under design basis conditions.

6.4.4 MOV Performance Prediction

Analytical techniques and methodologies utilized to provide assurance of MOV capability will have adequate bases documented (e.g.- empirical data, independent validation).

6.4.5 Prioritization Based on Safety Significance

Each MOV will be evaluated utilizing both probabilistic (e.g.- PRA) and deterministic (e.g.- available thrust margin, expert panel) methods to allow the prioritization of activities to reflect the relative importance of each MOV to overall plant safety.

6.4.6 Valve Mispositioning

In Supplement 4 to NRC Generic Letter 89-10 (reference 9.1.5), the NRC removed the recommendation that BWRs address inadvertent MOV operation. Therefore, recovery from mispositioning **will not** be considered when determining the system conditions for the MOVs.

6.4.7 Pressure Locking and Thermal Binding

Each gate valve within the scope of this program will be evaluated for susceptibility to pressure locking and/or thermal binding. If the potential exists, then appropriate action will be taken to reasonably assure that these phenomena do not adversely affect the capability of the MOVs to perform their active safety functions. The completion of these activities will be scheduled based on specific NRC guidance.

6.4.8 Processing of Industry Publications

Information from external sources will be reviewed for applicability to the DAEC. Prior to utilizing the results of industry testing or studies, a technical review for acceptability will be performed.

6.4.9 Feedback of New Information

The assumptions, methodologies, margins and test equipment utilized in the determination and verification of control switch settings for MOVs have the potential to be influenced by new information (e.g.- test data or industry publications). Therefore, existing calculations and previous test results will be reviewed in a timely manner if there is a generic concern that operability issues may exist based on new information.

6.4.10 Trending of MOV Performance

MOV failures and test results will be examined within an appropriate frequency, typically not more than two years, as part of a monitoring and feedback effort to establish trends of MOV performance.

7.0 DOCUMENTATION

7.1 MOV Program Manual

MOV Program Manual will consist of documents providing guidance in the following areas:

- Program Implementation (e.g.- Program Plan, References)
- Program Scope (e.g.- Prioritization, Dynamic Testing Scope)
- Program Engineering (e.g - Electrical Design Guide)
- Program Valve Operator Maintenance (e.g.- MOV Overhaul Planning)
- Program Valve Operator Testing (e.g.- MOV Testing Planning)
- Program Position Papers (e.g.- Extrapolation Methodology, Rate of Loading Effects)

7.2 Design Documents

Design documents (e.g.- calculations, drawings) shall be issued, controlled and utilized in accordance with Engineering Department procedures.

7.3 Plant Procedures

Plant procedures (e.g.- maintenance, test, operation) shall be issued, controlled and utilized in accordance with DAEC procedures.

7.4 Test Results

7.4.1 MOV test results and engineering evaluations that support operability shall be treated as lifetime Quality Assurance (QA) records.

7.4.2 MOV diagnostic test data in hard copy form and immediate test evaluations necessary to document the acceptability of the specific MOV test will be retained as part of the maintenance work package. Diagnostic test data stored on magnetic media (e.g.- computer disk) is not considered a QA record, however the data will be indexed and retained for future reference, trending and maintenaace actions.

7.4.3. Other records which furnish documentary evidence of the quality of MOVs (such as supplemental engineering evaluations) will be maintained as part of a Special Project File (SPF-152). The MOV specific records of SPF-152 will be compiled as "Working Records" until the DAEC commitment to Generic Letter 89-10 is closed. At the close of the commitment, the MOV specific records will be transferred to permanent storage facilities.

8.0 SCHEDULE

Unless noted otherwise, all required design basis reviews, analyses, verifications and tests will be completed by June 28, 1994 (five years from the date of NRC Generic Letter 89-10), unless a schedule extension is granted by the NRC.

The schedule for completion of activities associated with the pressure locking and thermal binding issues will be based on specific NRC guidance.

9.0 REFERENCES

9.1 NRC Generic Letter 89-10 and Supplements

9.1.1 NRC Generic Letter 89-10 (6-28-89); "Safety-Related Motor-Operated Valve Testing and Surveillance"

9.1.2 Supplement 1 to NRC Generic Letter 89-10 (6-13-90); "Results of the Public Workshops"

9.1.3 Supplement 2 to NRC Generic Letter 89-10 (8-3-90); "Availability of Program Descriptions"

9.1.4 Supplement 3 to NRC Generic Letter 89-10 (10-25-90); "Consideration of the Results of NRC-Sponsored Tests of Motor-Operated Valves"

9.1.5 Supplement 4 to NRC Generic Letter 89-10 (2-12-92); "Consideration of Valve Mispositioning in Boiling Water Reactors"

9.1.6 Supplement 5 to NRC Generic Letter 89-10 (6-28-93); "Inaccuracy of Motor-Operated Valve Diagnostic Equipment"

9.2 Other NRC Documents

9.2.1 NRC IE Bulletin 85-03 (11-15-85); "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings"

9.2.2 Supplement 1 to NRC IE Bulletin 85-03 (4-27-88); "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings"

9.2.3 NRC Generic Letter 89-04 (4-3-89); "Guidance on Developing Acceptable Inservice Testing Programs"

9.2.4 NRC Generic Letter 91-18 (11-7-91); "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability"

10.0 APPENDICES

10.1 Appendix A: Generic Letter 89-10 Program Plan Population

APPENDIX A: Generic Letter 89-10 Program Plan Population

SUS	SYSTEM	FUNCTIONAL DESCRIPTION	MOV ID(s)
14.00	RBCCW	Drywell Supply	MO-4841B
		Drywell Return	MO-4841A
16.00	RHRSW	RHR Hx Tube Side Outlet	MO-2046, MO-1947
		Crosstie to RHR, Outboard	MO-1943A, MO-1943B
		Crosstie to RHR, Inboard	MO-1942
		Return to Cooling Towers	MO-1998A, MO-1998B
45.01	FW	Inlet Stop Check	MO-4441, MO-4442
49.00	RHR	Suction, Inboard, SDC	MO-1908
		Suction, Outboard, SDC	MO-1909
		Suction, Pump, SDC	MO-2011, MO-2016, MO-1912, MO-1920
		Suction, Inboard, Torus	MO-2069, MO-1989
		Suction, Pump, Torus	MO-2012, MO-2015, MO-1913, MO-1921
		Minimum Flow	MO-2009, MO-1935
		Hx Shell Side Inlet	MO-2029, MO-1939
		Hx Shell Side Bypass	MO-2030, MO-1940
		Hx Shell Side Outlet	MO-2031, MO-1941
		Hx Shell Side Vent, Outboard	MO-2044A, MO-1949A
		Hx Shell Side Vent, Inboard	MO-2044B, MO-1949B
		Hx Drain to RCIC Pmp Suction	MO-2036, MO-1967
		Hx Drain to Torus	MO-2038, MO-1970
		Inject, Outboard	MO-2004, MO-1904
		Inject, Inboard	MO-2003, MO-1905
		Spray, Drywell, Outboard	MO-2001, MO-1903
		Spray, Drywell, Inboard	MO-2000, MO-1902
		Spray, Torus, Outboard	MO-2005, MO-1932
		Spray, Torus, Inboard	MO-2006, MO-1933
		Test/Torus Cooling	MO-2007, MO-1934
		Crosstie	MO-2010
		Drain to Radwaste, Outboard	MO-1936
		Drain to Radwaste, Inboard	MO-1937
		Head Spray, Outboard	MO-1901

APPENDIX A. Generic Letter 89-10 Program Plan Population

SUS	SYSTEM	FUNCTIONAL DESCRIPTION	MOV ID(s)
50.00	RCIC	Steam Supply, Inboard	MO-2400
		Steam Supply, Outboard	MO-2401
		Steam Supply, Turbine	MO-2404
		Trip/Throttle, Turbine	MO-2405
		Lube Oil Cooling	MO-2426
		Suction, CST	MO-2500
		Suction, Inboard, Torus	MO-2516
		Suction, Outboard, Torus	MO-2517
		Minimum Flow	MO-2510
		Discharge, Pump	MO-2511
		Inject	MO-2512
		Test	MO-2515
51.00	CS	Suction, Inboard	MO-2147, MO-2146
		Suction, Outboard	MO-2100, MO-2120
		Minimum Flow	MO-2104, MO-2124
		Inject, Outboard	MO-2115, MO-2135
		Inject, Inboard	MO-2117, MO-2137
		Test	MO-2112, MO-2132
52.00	HPCI	Steam Supply, Inboard	MO-2238
		Steam Supply, Outboard	MO-2239
		Steam Supply, Turbine	MO-2202
		Lube Oil Cooling	MO-2247
		Turb Exh Vac Breaker, Outbrd	MO-2290A
		Turb Exh Vac Breaker, Inbrd	MO-2290B
		Suction, CST	MO-2300
		Suction, Inboard, Torus	MO-2321
		Suction, Outboard, Torus	MO-2322
		Minimum Flow	MO-2318
		Discharge, Pump	MO-2311
		Inject	MO-2312
		Test	MO-2316

APPENDIX A: Generic Letter 89-10 Program Plan Population

SUS	SYSTEM	FUNCTIONAL DESCRIPTION	MOV ID(s)
54.00	ESW	CB Chiller Well Water Supply	MO-2039A, MO-2039B
		CB Chiller Well Water Return	MO-2077, MO-2078
61.00	RWCU	Suction, Inboard	MO-2700
		Suction, Outboard	MO-2701
		Return	MO-2740
62.00	Boiler	RHR Head Spray, Inboard	MO-1900
		Main Steam Drain, Inboard	MO-4423
64.01	RECIRC	Suction, Pump	MO-4601, MO-4602
		Discharge, Pump	MO-4627, MO-4628
		Discharge Bypass, Pump	MO-4629, MO-4630
70.00	SBGT	Inboard Torus Vent Bypass	MO-4309A
		Inboard Drywell Vent Bypass	MO-4310A
73.03	CAD	Regulator Inlet	MO-4323A, MO-4323B
		Regulator Outlet	MO-4320A, MO-4320B
83.01	Mn Stm	Main Steam Drain, Outboard	MO-4424
83.03	MSIV-LCS	Bleed, Inboard	MO-8401A, MO-8401B, MO-8401C, MO-8401D
		Bleed, Outboard	MO-8402A, MO-8402B, MO-8402C, MO-8402D
		Bypass	MO-8403A, MO-8403B, MO-8403C, MO-8403D